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PATENT

Docket No. H1215/1556 PCT/US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**RECEIVED
CENTRAL FAX CENTER**In re: Application of
Kluth et al.

Confirmation No. 6917

MAR 14 2006

Serial No. 08/702,625

Examiner: John M. Cooney

Filed: 08/23/1996

Art Unit: 1711

TITLE: FOAM PLASTIC FROM DISPOSABLE PRESSURIZED CONTAINERS

CERTIFICATION OF FACSIMILE TRANSMISSION

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Mary Lynne Carlisle

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RESPONSE UNDER 37 CFR 1.111Commissioner for Patents
P. O. Box 1450
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Sir:

In response to the Official Action of November 17, 2005, Applicants respectfully request that the rejection be reconsidered in light of the following discussion.

Before discussing the rejection over the prior art, Applicants deem it prudent to set forth what they consider to be their invention.

The invention is a system for the production of plastic foam. The system comprises: a disposable pressurized container containing a composition comprising, at least one polyisocyanate or polyisocyanate prepolymer, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer, wherein not later than one day after application of plastic foam from the disposable pressurized container, the residue left in the pressurized container has a diisocyanate monomer content of less than 5% by weight, based on the residual contents of the emptied container. The system also can include a

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polyisocyanate or isocyanate prepolymer with a diisocyanate monomer content less than 3% by weight based on the prepolymer, an NCO functionality of 2 to 5, and an NCO content of 8 to 30% by weight based on the weight of the prepolymer with a viscosity of 5 to 200 Pa·s at 25°C.

The low content of diisocyanate monomer in the container after the foam has been expelled can be achieved as follows:

1. Using low diisocyanate monomer content prepolymer which must contain 8-30% by weight NCO groups.
2. Introducing a trimerization catalyst into the pressurized container immediately before or after the contents are released from the container.
3. Introducing an OH containing compound into the pressurized container immediately before or immediately after the contents are removed from the container.
4. Using a cyclotrimer with a low diisocyanate content as the prepolymer.
5. Using polymer MDI with a low diisocyanate content as the prepolymer.

The system of the invention comprises a disposable pressurized container containing a composition having an NCO content of from about 8 to 30% by weight, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer.

The polyisocyanate or polyisocyanate prepolymer must have an NCO content of from about 8 to about 30% by weight based on the weight of the prepolymer. The high NCO content is required to permit the foam composition to cure rapidly so that the foam does not collapse before the cell walls are stabilized to the required extent to support the foam.

The container must also contain at least one catalyst for the reaction of the isocyanate group with an OH group. This is required to permit the foam to polymerize at a rate sufficiently rapid to stabilize the walls of the foam cells before the foam collapses.

The system of the invention also requires the presence of a blowing agent to

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form the foam when the contents of the container under pressure are released.

The composition of the present invention must also contain a foam stabilizer, which provides a foam with the required cell size.

All of the components must be present in the composition for it to effectively function as a system for producing a foam. Other optional ingredients can be incorporated in the composition but the polyisocyanate or isocyanate prepolymer having an NCO content of from about 8 to about 30% by weight of the prepolymer, the catalyst, blowing agent and foam stabilizer are critical to the composition. Appellants submit that the prior art cited by the Examiner neither teaches nor suggests the present invention.

The claims stand rejected under 35 U.S.C. §103(a) as obvious over Pauls. (U.S. 4,263,412) in view of Schmalstieg et al. (CA 2084698; herein after noted as Canada) and Minato et al. (U.S. 5,086,175). Appellants respectfully submit that the references whether considered alone or in combination neither teach nor suggest the present invention.

Pauls is related to the prior art disclosed by applicants. Pauls discloses a system for dispensing one component polyurethane foam from a container in which the foaming components are separated by a flexible membrane from the propelling gas. The device has the advantage that only a small amount of the foaming agent is required. The small amount of foaming agent permits selection from a broader range of foaming agents since certain useful foaming agents are soluble to only a limited extent in one component systems. Pauls represents the prior art cited by applicants.

Pauls teaches that the components which react to form the isocyanate component of the mixture are introduced into the container and reacted therein (see examples 1 to 27, column 7 lines 54, 55 and column 8 lines 25-29). A less preferred method is to react the isocyanate forming components in a kettle and pack the reaction mixture from the kettle into the container. As is known in the prior art, since the ratio of NCO groups to OH groups is preferably from 4 to 8, the amount of unreacted diisocyanate monomer in the contents of the container is high (greater than 5% by

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weight of the isocyanate component).

The large amount of unreacted diisocyanate monomer in the contents of the Pauls container presents no problem; since at column 7, lines 61-65, Pauls teaches:

"The inner container (1), the special shape of which permits virtually complete expulsion of the foamable prepolymer mixture containing isocyanate groups, consists either of aluminum or a resilient plastic, e.g., high pressure polyethylene." (Emphasis added by appellants.)

Appellants submit that since the Pauls device permits virtually complete expulsion of the foamable prepolymer mixture containing diisocyanate monomer from the container, there is no incentive to reduce the content of diisocyanate monomer in the contents of the container to ease waste disposal. Since Pauls teaches that the preferred method of filling the container is by reacting the components in the container of the system or in a separate container then filling the system, which methods produce a foaming composition with a high concentration of diisocyanate monomer, applicants submit that Pauls is not concerned with the high concentration of monomer in the contents of the container since the container is virtually emptied due to its unique design and little monomer or prepolymer remains in the container after the foaming composition is expelled. There is no concern with a high monomer content in the foaming composition since little foaming composition remains in the container after use.

There is no suggestion in Pauls to use a low monomer content foaming composition or a composition which has a low monomer content after the system is used. In addition, there is no teaching that low diisocyanate monomer content diisocyanates would provide a useful foaming resin.

The deficiencies in the teaching of Pauls are not cured by combination with Canada and Minato et al. Canada and Minato et al. disclose isocyanate-containing compositions having a low content of diisocyanate monomers which are useful for

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lacquers and adhesives. As set forth in the references, Canada and Minato et al. teach that a prepolymer is prepared using an excess of the diisocyanate monomer and the excess unreacted diisocyanate monomer is removed from the reaction mixture by a distillation process. The amount of unreacted diisocyanate monomer in the composition can be less than 0.1% by weight of the composition (see Canada). However, the composition with the low content of unreacted diisocyanate is expensive to produce. One skilled in the art would have no incentive to include such an expensive material in the formulation used in the container of Pauls. The Pauls container permits virtually complete expulsion of the foamable prepolymer mixture and therefore the empty container does not present a disposal problem.

The Canada reference is not pertinent to the present invention. The Canada polyisocyanate is a solid material and would not produce an adequate foam and could be dispensed from the container only with difficulty. The isocyanate prepolymer or polymer must be a liquid material if the process of the present invention is to be operable. Appellants submit that the solid nature of the polyisocyanate of Canada would discourage its use in the system of the invention. The composition of Canada is specifically developed to be soluble in certain solvents to be useful as a lacquer or coating composition.

Nowhere in the teachings of Canada and Minato et al. is there any suggestion that the polyisocyanate would be useful in a foaming application. The Minato et al. composition was developed to be soluble in nonpolar solvents so that effective lacquer formulations could be made. The composition is particularly useful in a two package coating system. Canada discloses solid polyisocyanates which are useful in lacquer formulations. The polyisocyanates of Canada are generally dissolved in a solvent. Since it is preferred that the system of the present invention is a one component system and does not contain a solvent, Applicants submit that Canada neither teaches nor suggest the present invention.

As shown by the examples, the composition of Canada would not be useful as a

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one shot foaming material due to its long drying time (13 hours). In addition, since the prepolymers are solids, they would not be useful in the practice of the present invention.

Appellants submit that as disclosed in Canada and Minato et al., it is known in the art to prepare polyisocyanate containing compositions with a low content of diisocyanate monomer. However, these compositions are known for use in lacquers or adhesives. Lacquers and adhesives are relatively expensive materials which can afford the extra process steps in preparing the low diisocyanate monomer material. However, there would be no incentive for one skilled in the art to include the expensive low diisocyanate content material in a system for forming a foamed resin comprising the container of Pauls from which virtually all of the contents are expelled, to reduce the expense of disposing of the container.

Appellants respectfully submit that the rejection over the combination of Pauls in view of Canada and Minato et al. is improper. To formulate a rejection over a combination of references there must be some suggestion in the references to make the combination. As discussed above, the only suggestion to combine the teachings of the references is in the present application. Clearly, one skilled in the art would not be led to include a low diisocyanate monomer content prepolymer in the container of Pauls, since the single component foaming mixture is virtually completely expelled from the container and the empty container would not present a disposal problem. Appellants therefore submit that the rejection is improper and request that it be reversed.

Appellants have provided a novel and unobvious system for providing a plastic foam. The system has a major unrecognized advantage in disposal of the empty container. Applicants submit that the prior art cited by the examiner provides no teaching or suggestion of the system of the invention. Pauls teaches the known system for forming foams; Canada and Minato et al. discloses low monomer content materials used for coatings and adhesives. There is no suggestion or incentive to combine the

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teachings of the references.

The combination of Pauls with Canada and Minato et al. is deficient in not teaching or suggesting that polymeric isocyanates or polymeric MDI be utilized as the polyisocyanate in a one component polyurethane foam forming system. There is no teaching or suggestion that polyisocyanates and polymeric MDI are suitable foaming agents for one component foam systems.

In view of the above, appellants submit that the present invention is neither taught nor suggested by the combination of Pauls, Canada and Minato et al. and request that the Examiner's rejection be reversed.

Appellants also submit that use of a low diisocyanate monomer content prepolymer is only one possible solution to the problem, provided by the system of the present invention:

Disposable containers for generating foam plastic are known. However, the prepolymers utilized in the known systems were formed by mixing a large excess of the diisocyanate with OH terminated diols in the container to form a useful prepolymer. However, since the compositions require a large stoichiometric excess of the diisocyanate, the compositions contain high concentrations of unreacted diisocyanate monomer. The present invention provides a method for forming a system which provides for residues with low monomer content in the pressurized container after use. The container can be designed to introduce an isocyanate cyclotrimer catalyst into the composition immediately before, during or after the contents have been removed from the container or introducing a low molecular weight alcohol into the container after the foam producing contents have been expelled from the container. Trimerization catalyst or the alcohol provide reactions which remove the diisocyanate monomer from contents of the container.

Systems for producing foamed plastics from pressurized containers were well known at the time the present invention was made. However, the systems were not concerned with residual amounts of unreacted diisocyanates in the pressurized

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container. The systems all contained substantial amounts of unreacted diisocyanate monomer in the container or the container was designed to expel substantially the entire contents of pressurized container so that there was little or not diisocyanate monomer remaining in the pressurized container.

In formulating the rejection, the Examiner is completely ignoring the properties of the cured and uncured compositions containing large amounts of diisocyanate monomers.

As shown in Canada and Minato et al., the properties of the uncured and cured composition is determined by the composition and even by the method by which the composition was prepared. Applicants submit that in the prior art, foaming compositions contained large amounts of unreacted diisocyanate monomers; there was no assurance that a composition which did not contain the unreacted diisocyanate monomer would provide a composition that provided a useful foam product. There is no assurance in the prior art that low diisocyanate monomer content material would provide useful single component foams.

Applicants submit that the large amounts of unreacted MDI in the Pauls composition (28%-33%) would be expected to produce a foam with substantially different properties from a composition which did not contain substantial amounts of unreacted diisocyanate monomer. One skilled in the art would not know whether the composition of the present invention would produce useful foams.

The rejection appears to be based on the Examiners speculation that all prepolymer mixtures produce useful foams. This is a false speculation since it would be clear that the Canada formulation at least would not provide a useful foam since it is a solid rather than a liquid and a solvent is required.

The Minato et al. composition would not produce a useful foam since a solvent is required.

Applicants submit that a rejection based on a combination of two references which cannot be used to form a foam with Pauls is untenable and request that the rejection be reconsidered and withdrawn.

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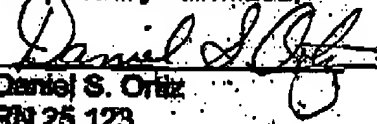
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Applicants further submit that there is neither teaching nor suggestion that a foaming composition comprise a major portion of polymer MDI and a NCO content of 26% to 30% by weight as the prepolymer therefore claims 28-33 and 53-58 are patentable over the prior art of record.

In view of the above discussion, Applicants respectfully submit that the rejection of the claims is untenable and request that the rejection be reconsidered and withdrawn.

Respectfully submitted,


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